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THE MEDICARE EXPERIENCE WITH END-STAGE RENAL DISEASE: TRENDS IN INCIDENCE, PREVALENCE, AND SURVIVAL

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EXECUTIVE SUMMARY

This paper presents a detailed account of the incidence, prevalence, and survival experience of persons with end-stage renal disease (ESRD) covered by Medicare. It also provides a 50-year projection of the population covered under the ESRD program. Data are taken from the experience of persons with ESRD and covered under the Medicare program.

The study shows that the number of new entrants into the ESRD program has risen since the program's inception. From 1978 to 1980, there was a 15-percent increase in the number of new ESRD beneficiaries. This increase is greatest for persons whose cause of renal failure is primary hypertensive disease or diabetic nephropathy. The program incidence rates for black people is 2.8 times that of white people. Incidence is highest for persons 65-69 years of age.

The most important predictors of patient survival are age and primary diagnosis. Sixty-one percent of persons 15-24 years of age survive 6 1/2 years after renal failure onset; only 16 percent of persons 75 years of age or over survive as long. Persons whose renal failure results from polycystic kidney disease have the best survival and persons with diabetic nephropathy have the worst.

Total Medicare enrollment for ESRD quadrupled between the years 1974 and 1981, although the rate of increase has shown a steady decrease. The rate of increase is expected to continue to decline even though program enrollment will not level off in the foreseeable future.

INTRODUCTION

End-stage renal disease (ESRD) is the generic term used to describe a wide variety of diseases, trauma, and the like which result in the terminal failure of the kidneys to function sufficiently well to maintain body fluid volume and composition. The measure typically used to describe the excretory functions of the kidneys is the glomerular filtration rate (GFR). Normally, the body possesses a large excess capacity to perform this function. Symptoms of renal impairment usually do not appear until the GFR has fallen to 25 percent of normal. Late chronic renal failure is said to occur when the GFR approaches 10 percent of normal and the point at which renal failure becomes terminal, or life threatening, is reached when the GFR falls to 5 percent of normal.

There are two basic treatments available to persons with end-stage renal disease--transplantation and dialysis. Transplantation dates back to 1956 when the first successful transplant was performed on identical twins. Successful transplants of kidneys from cadavers dates to the early 1960's. In 1982, there were more than 5,300 kidney transplantations performed in the United States (HCFA, 1983). Of these, approximately 70 percent were cadaveric transplants and 30 percent were from live related donors. A successful kidney transplant results, in effect, in a "cure" for the ESRD patient. The patient must maintain permanent immunosuppressive drug therapy to prevent rejection and there can be severe side effects to these drugs. However, the patient has a functioning kidney and is essentially free of maintenance renal therapy.

The second treatment available to ESRD patients is dialyses, of which hemodialysis is the most common. Hemodialysis involves the circulation of the body's blood through a machine that cleans the blood of toxins. The first artificial kidney machine was developed in the early 1940's in Holland. The early machines could maintain life only so long as the patient was continuously connected to the machine. In 1960, a subcutaneous cannulae-and-shunt apparatus was developed that permitted the repeated access of patients to hemodialysis on a, more-or-less permanent basis. Maintenance hemodialysis as a viable treatment for ESRD patients can be traced from this time. A typical hemodialysis patient will dialyze three times per week for about 4 hours each session. About 87 percent of current dialysis patients are on hemodialysis, either at a dialysis facility or at home (HCFA, 1983).

Another major form of dialysis is peritoneal dialysis. In this form, a dialysate solution is introduced into the peritoneal cavity. Osmatic pressure causes body wastes to pass from the bloodstream into the dialysate. After a time, the dialysate solution containing the wastes is drained. Intermittent peritoneal dialysis (IPD) is done four times a week for a 10-hour period. A newer form of peritoneal dialysis is continuous ambulatory peritoneal dialysis (CAPD). Rather than have a few large exchanges of fluid as in IPD, CAPD patients maintain a continuous dialysis solution in the peritoneum with four exchanges of fluid per day. CAPD patients are home patients, that is, they do not have to travel to an ESRD facility for treatment. As such, CAPD allows the patient greater freedom of mobility than patients on hemodialysis have and is a rapidly growing treatment modality. In 1979, CAPD was just starting to be used with a few patients. It has since grown by about 2,000 persons a a year. Currently, about 6,500 patients aze dialyzing by this method.

Determination of appropriate treatment therapy for ESRD patients is a complex process envolving the patient's age, primary cause of renal failure, co-morbid conditions, and family support structure as well as patient and physician preferences.

With the enactment of the Social Security Amendments of 1972 (Public Law 92-603, Section 299I), Congress extended Medicare coverage to most of the persons suffering from ESRD. Coverage began on July 1, 1973. Since that time, there has been one major change to the program, the End-Stage Renal Disease Program Amendment of 1978 (Public Law 95-292). This amendment was designed to promote efficiency and economy in the delivery of services by encouraging home dialysis and transplantation for the maximum number of suitable patients. Changes implemented through this amendment included extension of eligibility from 1 to 3 years post transplantation, increased coverage of kidney acquisition costs, 100-percent reimbursement for home dialysis equipment, and expanded coverage of home dialysis supplies.

Since the implementation of the original ESRD law, the program has experienced rapid growth both in the population served and in program costs. In 1974, Medicare expenditures for the 16,000 persons covered under the program were $250 million. By 1979, costs had risen to $1 billion and enrollment to 51,000. The 1982 expenditures are expected to be $1.8 billion and, by 1986, costs are projected to reach $2.8 billion (HCFA, 1983).

This paper, and a companion paper in preparation, provides a comprehensive description of the ESRD program from 1974 through 1979. This study focuses on the characteristics of the patient population. We have generated

a wide array of tabulations to study changes in incidence and prevalence of ESRD as well as variations in these measures by basic demographic characteristics (age, sex, and race) and by geographic area. Additional analyses focus on the primary diagnosis leading to renal failure, how these have changed over time, and variations in diagnoses by age, sex, and race. A second area of analysis examines the survival experience of the ESRD population during the initial years of the program. Finally, the implications of current incidence rates are explored by modeling the potential growth of the program.

RESEARCH ON ESRD

Incidence and Prevalence

There has been considerable effort devoted to determining the demographic factors that affect incidence and prevalence of ESRD. Race has been shown to be an important correlate of the incidence of end-stage renal disease (Wineman, 1980; Hiatt and Friedman, 1982; Mausner, et al., 1978; Rostand et al., 1982; Relman, 1980; Esterling, 1977). The estimates of the overall ratio between incidence rates for black people to incidence rates for white people range from 3.2 (Hiatt and Friedman, 1982) to 4.2 (Rostand, et al. 1982). Less well publicized but still apparent in the renal incidence literature is the importance of sex as a determinant of renal failure (Hiatt and Friedman, 1982; Mausner, 1978; Rostand, et al., 1982). The effect is not as large as is the case with race. Nevertheless, the reported incidence rates for males are between 30 percent to 40 percent higher than for females. Finally, age has been shown to be a critical factor in the studies of renal failure incidence rates (Hiatt and Friedman, 1982; Mausner, et al., 1978, Rostand, et al., 1982). Estimated rates per million ranges from under 10 for the population 0-14 years of age up to 150 for the aged population or even higher (Hiatt and Friedman, 1982; Mausner, et al., 1978; Rostand, et al., 1982).

The United States has the highest rate of treatment of persons with ESRD in the world. In a comparison of European and U.S. experience (Protts, et al., 1983), some of the reasons for national differences in the rate of dialysis treatment were examined. The authors found dialysis prevalence rates in 17 Western European nations ranging from 31 per million to 144 per million. The U.S. rate was 209 per million (all rates were based on 1978 data). However, the authors estimate that about half the difference between U.S. and European rates can

be attributed to racial differences. Black people, with the highest rates of renal failure, comprise a very small part of European populations. Much of the remaining differences can be attributed to eligibility restrictions in most European nations which limit access to dialysis for the elderly and patients with significant medical complications. The United States essentially has no restrictions on access based on age or medical criteria.

Even within the United States there appears to be significant variation in the treatment of renal failure. Relman and Rennie, 1980, examined State variation in dialysis prevalence using the 1979 ESRD facilities survey. The authors found rates ranging from a low of 20 per million in Wyoming to a high of 383 per million in Hawaii. The authors concluded that, "Eight years after the enactment of a Federal law providing universal entitlement to treatment of ESRD, we find an extraordinary variation in the law's application."

Readers quickly pointed out that there are many possible explanations for the seemingly unjustified variations in dialysis rates (Held, et al., 1981; Evans and Blagg, 1981; Lowrie, 1981; Velez and Charlton, 1981; Lemann, 1981). Among the reasons suggested for variations in dialysis rates are racial composition, age composition, urbanization, physician supply, and per capita income. Analyses were presented which indicated that indeed many of these variables did correlate with dialysis rates. There are other limitations in the data available to Relman and Rennie that were not addressed by the initial critics. First, the analysis centered on prevalence rather than incidence. Thus, differences among States could be, in part, because of different rates of transplantation, patient survival, and patient movement after onset of renal failure. For instance, patients may well move to a new State if that State provides better coverage for the costs of treatment not covered by Medicare. For these reasons, the number

of dialysis patients per million persons in the State is an inaccurate measure of the rate of renal failure. Rather, the rate of newly treated cases each year, termed "incidence" in this report, is a more direct measure of the rate of renal failure.

Second, the Facilities Survey Report used in the study cited above gives the number of renal persons by place of dialysis rather than place of residence. Thus, the numerator (people receiving dialysis within a State) is not precisely related to the denominator (people living in a State). The rate reported for the District of Columbia appears strikingly high when in fact many of the patients dialyzing there live in Maryland or Virginia.

Third, the incidence rate of renal failure is so low that a difference of a few cases from 1 year to the next can greatly affect the rate in a small State.

A final issue relates to medical practice. Apparently, there is considerable professional uncertainty about the efficacy of dialyzing elderly patients (those over 65 years of age). This uncertainty could result in differences in medical practice which should not be construed as "good" or "bad." However, such differences in practice could result in differing dialysis rates.

The present study addresses many of the issues raised by earlier analyses of incidence and prevalence. Detailed age, sex, and race incidence rates are calculated that indicate much more precisely than was possible in other studies the interrelationships of demographic factors in explaining variations in treatment of renal failure. Diagnostic specific incidence rates are also provided that demonstrate the changes taking

place in patient mix and the age, sex, and race variations in causes of renal failure. Finally, an analysis is provided that examines State variations in treatemnt of renal failure, controlling for variables available in earlier efforts.

Survival

Patient survival of the Medicare ESRD population is published each year in the ESRD annual report to Congress. These analyses, calculated by the National Cancer Institute using HCFA's Medical Information System (MIS) data base provide basic age, sex, and race variations in patient survival. The most recent analyses (HCFA, 1983) show that 81 percent of patients on dialysis can be expected to survive 1 year after onset of renal failure, 57 percent survive for 3 years, and 38 percent survive for 5 years. The analyses in this report expand on the ESRD annual report by examining patient survival by primary diagnosis and by analyzing changes that may have occurred in patient survival since the program's inception.

Program data on survival of transplant patients has always been limited by the fact that patients with functioning grafts lose entitlement after 3 years. After losing entitlement, it becomes virtually impossible to validate survival. Consequently, patient survival on transplant is necessarily limited to 3 years post transplantation.

Since the program's inception, 3-year survival for all transplanted patients is 82 percent. A recent analysis of Medicare transplants occurring since 1977 has shown 3-year patient survival of 78 percent for cadaver transplants and 91 percent for live related donor transplants (Krakauer, et al., 1983). The present study does not include analysis of transplant patients.

Projections

Projections of the growth of a program such as the ESRD program are always subject to considerable error because of changes in treatment patterns, resource availability, and a myriad of unforeseen consequences. An early estimate of program growth (Klar, 1972) had the program growing to 35,000 persons within 5 years. In congressional testimony in 1975, the Department of Health, Education, and Welfare projected a continuing growth of the program up to the range of 50,000 to 60,000 persons (Van Hoek, 1975). More recent projections reported in the literature estimate a leveling of the ESRD population at about 90,000 (Iglehart, 1981; Kolata, 1980). These figures apparently are based on estimates by HCFA's Office of the Actuary (Rettig, 1980) that project program enrollment to reach 90,000 by the year 1995. However, as long as the total population of the United States continues to grow, there should be at least a comparable growth in the ESRD program enrollment. This study projects program enrollment based on demographic changes and growth in the U.S. population.

DATA SOURCES

Data for this study were taken from two sources: (1) the Medicare Statistical System (MSS), and (2) the ESRD Medical Information System (MIS). The MSS is a by-product of the basic administrative data system which is used to determine eligibility and monitor program expenditures for the 30 million Medicare beneficiaries currently entitled to Medicare. The Master Beneficiary Record is used to maintain individual entitlement information and provides the basic age, sex, race, residence, entitlement, and death information used in the analysis. From 1973 through 1979, approximately 100,000 different individuals were identified as Medicare beneficiaries with ESRD for some length of time. The analyses in this are based on the universe of ESRD patients covered by Medicare during these years. The second source of information from the MSS are the claims records. Each bill for payment (including inpatient, outpatient, physician and supplier, skilled nursing facility, and home health care) results in a claim record. These records were matched to the Master Beneficiary Record using the Medicare health insurance claim number and then aggregated by person to calculate per capita costs. For the years 1973 through 1979, 15,000,000 such records were generated for the ESRD population. Finally, these data from the MSS were merged with information from the MIS. Data in the MIS are taken from specific HCFA medical reporting forms and include date of first dialysis and primary diagnosis (HCFA 2742), evidence of dialysis services (HCFA 2743), and dates of transplantation (HCFA 600-1). The MIS was originally maintained by a private firm under contract to the Social Security Administration prior to the creation of HCFA. In 1977, with the creation of HCFA and the centralization of ESRD functions into this single administrative unit, the data maintenance responsibilities

were assumed by HCFA itself. Consequently, there has been a slight discontinuity in procedures and operation from the pre-1977 period to the post-1977 period. This does not greatly affect certain analyses such as program enrollment and survival analyses, but it does make trends in incidence difficult to estimate. The analyses that follow take into account this discontinuity.

RESULTS

ESRD Program Incidence

In this section, we examine incidence rates in the ESRD program to determine what trends are taking place with regard to new entrants and how these will affect the program.[1] As discussed above, the transition of control of the data system from contractor to HCFA in-house operation has resulted in a slight discontinuity between data prior to 1977 and data thereafter. Therefore, the analyses in this section will highlight trends from 1978 onward.

The 3 years, 1978-1980, show an increasing number of persons annually with onset of renal failure and entitled to Medicare coverage (Table 1). In 1978, the Medicare program incidence was 15,584, and by 1980, it had risen by 17 percent to 18,279. The largest increases occurred in the older age groups. For the age groups 55-64, 65-74, and 75 years of age and over, the total increase in incidence was

[1] It should be noted that this section deals with "Medicare ESRD program incidence," and not total incidence of renal failure in an epidemiological sense. About 7 percent of all treated renal failure is not Medicare covered and are, of necessity, excluded from this analysis (ESRD Report to Congress, 1981). In addition, an unknown amount of renal failure will not be treated each year due to age, poor prognosis, or misdiagnosis.

21 percent, 21 percent, and 67 percent, respectively. The increase was identical for males and females. By race, the increase for white people was 16 percent, for black people 19 percent, and for other races 30 percent.[2] Table 2 presents the ESRD program incidence (new cases) per million population. Because of the growth in the U.S. population, the ESRD program incidence rate is growing somewhat more slowly than the actual number of new beneficiaries. In 1980, the overall program incidence rate was 82 per million. Incidence rose rapidly with age from 7 per million in the 0-14 years of age group to 241 per million in the 65-74 years of age group. For those 75 years of age and over the rate dropped sharply to 153 per million. The incidence rate for males was 95 per million, or 36 percent higher than the 70 per million rate for females. White people had an incidence rate of 67 per million. The rate for black people was 2.8 times as high at 185 per million. The rate for other races was 140 per million, or twice that of white people.

To show more clearly the relationships among age, sex, and race groups in ESRD program incidence we combined data for the 3 years 1978-1980 and calculated detailed age specific incidence rates for white people and all others and by sex within race. The rates were then smoothed using a moving average to control for minor fluctuations in rates across age groups resulting from small numbers of people.[3] The results of this analysis are presented in table 3 and shown graphically in Figure 1.

[2] In this and all subsequent analysis involving the calcuation of rates by race, persons of unknown race were assigned to the race categories in direct proportion to the distribution of known codes. For example, if 80 percent of persons with known rates were white people, then 80 percent of the unknowns were included in the count of white people.

[3] The moving average was calculated as the weighted average across three age groups. Thus the average incidence rate shown for white males 40-44 years of age is actually the weighted average of white males 35-39, 40-44, and 45-49 years of age. For a discussion of the use of and problems of moving averages, see Wallis and Roberts, Statistics: A New Approach, 1956.

Several important relationships become evident in this analysis. The first is the overriding importance of the effect of age on renal failure. For persons under 10 years of age, the incidence rate is fewer than 10 per million. This rises sharply in succeeding age group up to almost 100 per million in the 40-45 age group and peaks in the age groups 65-69 and 70-74 at about 220 per million. After 75 years of age the incidence drops sharply to the point where the incidence rate for persons 85 years of age and over is 43 per million. It is important to reemphasize at this point that these are Medicare ESRD program incidence rates and thus reflect treated cases only. It is probable that the absolute rate of kidney failure continues to rise with age but that the consensus among physicians is that dialysis will not prolong life for the oldest patients. It is likely that very few patients initiate dialysis therapy above the age of 90.

A second point to be made is the effect of age on the racial differences in program incidence. Overall, the all other race group has an incidence rate which is 2.7 times as great as for white people (169 and 63, respectively). This difference does not, however, appear until adulthood. From virtually no racial difference in the under 10 age group, the two groups diverge rapidly with increasing ages. By the 20-24 age group, all other people have twice the incidence of white people (57 and 28, respectively). The greatest racial difference is reached in the 55-59 age group where the all other group rate (547) is 4.2 times that of white people (130). Across the ages of 45 to 64 the all other group rate is roughly four times the white people rate. After 65 years of age, the racial differences begin to lessen as both groups near the point where virtually no one initiates dialysis.

Third, the basic relationship between males and females differ by race. For both races combined, males have incidence rates that are 35 percent higher than females. Among white people, the differential is 42 percent, compared with only 21 percent among all other people. For white people, the difference between males and females increases with age up to the 35-39 age group (57 percent higher for males), at which point, the difference tapers off slightly until age 65. At that point, the male incidence rate increases to twice the female rate for persons 75 years of age and over. Among black people, the relative sex difference peaks in the 30-34 age group where the male incidence rate is roughly twice the female rate (196 per million and 99 per million, respectively). Following this the female rate gradually approaches the male rate up to the 65-69 age group. Here, the male rate peaks at 646 per million, which is only 4 percent higher than the female rate of 623 per million.

Table 3 raises some interesting issues in regard to prevention. The age, sex, and racial variations in renal failure parallel trends in hypertension. Hypertension is defined as a systolic blood pressure of at least 160 millimeters of mercury or a distolic blood pressure of at least 95 millimeters of mercury. Hypertension has long been known to be more prevalent among black people (Harburg, et al., 1978a; Harburg, et al., 1978b; Keil, et al., 1978, Tyroler and James, 1978). Recent data from the National Center for Health Statistics (Rowland and Roberts, 1982) show that the rate of hypertension among black people is 69 percent higher than among white people. Hypertension is 39 percent more prevalent among white males than white females, but among black people the rate of hypertension among females is slightly higher than among males. It is generally accepted that hypertension is a contributing causal factor in

renal failure (as will be shown in the following section). Perhaps the historical discrepancies between black people and white people in access to health care (Aday, et al., 1980; Dobson and Ruther, 1981; Andersen, 1980) have also contributed to the different renal failure rates. To the extent that differences between white people and black people are socially determined and not genetic in origin, vigorous preventive measures could help reduce future renal failure rates.

Geographic Variation in Incidence

Table 4 shows Medicare program incidence rates by State, averaged across the 3 years, 1978-80. The rates are presented for all persons and for the white population under 65 years of age.

As shown, average yearly Medicare program incidence for all persons ranges from a high of 185 per million in the District of Columbia to a low of 26 per million in Alaska. The national average was 77. When the analysis is limited to the white population under 65 years of age, the national rate drops to 51 per million. Several of the States show a sharp decrease in incidence when persons of races other than white and persons 65 years of age and over are excluded from the calculation. For example, Georgia, Louisiana, North Carolina, and the District of Columbia have large populations of races other than white. The rates in these States decreased greatly. Florida, the State with the highest percent of persons over 65 years of age, had an overall program incidence rate of 107 per million, the under 65 years of age white rate was 70 per million.

Table 5, which groups the States together in ranges of program incidence, illustrates more clearly the impact of removing the effects of race and age on the program incidence rates. The four groups with ranges of 50-59, 60-69,

70-79, and 80-89 years of age account for 38 of the 51 States (including District of Columbia) in total program incidence. Thirteen States fall outside of this range, including seven States with rates in excess of 90 per million. When the analysis is limited to the white population under 65 years of age, the States group together markedly. Two intervals, 40-49 and 50-59 years of age, account for 41 of the States. It is worth noting that the two outlying States shown in table 4 are Alaska (31 per million) and Nevada (75 per million). If Alaska had had 7 more cases of renal failure and if Nevada had had 23 fewer cases of renal failure in the entire 3-year period, both areas would have fallen into the 40-59 ranges. This indicates the extent to which a few cases can markedly change incidence rates for small populations.

This analysis shows, therefore, that although geographic variation does exist in the incidence of renal failure, when adjusted for age and race, it is not so marked as suggested in the earlier study.

Incidence by Diagnosis

HCFA has required a patient history questionnaire (HCFA 2742) to be completed for each new ESRD patient. Heretofore, compliance has been a major problem. Through 1980, forms were received by HCFA for only about one-half of the newly entitled patients. Nevertheless, it is possible to examine the primary diagnoses reported on these forms to detect trends in ESRD incidence by diagnosis. Since it is unlikely that noncompliance in submitting this form is related to causes of renal failure, the distribution found each year should, more or less, reflect the distribution of causes of renal failure in the ESRD population. Future analyses of causes of renal

failure should be more accurate because the required information will be captured on the entitlement form itself. This would not apply for aged persons whose reason for entitlement (age) is unrelated to renal failure.

There has been a distinct change in the recorded primary diagnosis leading to renal failure since the beginning of Medicare coverage of ESRD. Table 6 shows the distribution of primary diagnoses from 1973 and earlier through 1980. Several trends are evident. First, glomerulonephritis has declined from 36.4 percent of all reported cases in 1973 and earlier to 19.7 percent in 1980. Many persons became entitled in 1973 whose renal failure occurred prior to 1973. Patient histories were received for many of these patients. There has been a concomitant rise in the relative proportion of renal failure cases attributed to primary hypertensive disease and diabetic nephropathy. Primary hypertensive disease has risen from 13.2 percent of all cases to 23.4 percent, and diabetic nephropathy has risen from 7.0 percent to 21.8 percent. Other notable changes among frequently reported cases include a decline in polycystic kidney disease (8.7 percent to 5.9 percent) and a decline in "other interstitial nephritis" from 12.5 percent to 6.4 percent. One interesting change has occurred in the categories "other, unspecified" and "etiology unknown." Through 1976, these categories each accounted for about 12 percent of all reported causes. In 1977, the first year that the MIS was made into an in-house data operation, there was a noticeable drop in these codes. The drop in "other, unspecified" has continued to the point where this category accounts for only 5.0 percent of cases in 1980. Also in 1977, there was a noticeable increase in some of the less frequently reported diagnoses (e.g. analgesic abuse nephropathy and the obstructive uropathies). Whether this amounts to an improvement in data coding or merely a change in assigning causes cannot be determined in this analysis.

Given that incidence rates are rising, examining merely the distribution of diagnoses does not present an adequate picture of the actual trends. The distribution of causes of renal failure was used to calculate diagnosis-specific incidence rates in Table 7. This assumes that the distribution of causes of renal failure among unknown cases is similar to that for reported cases. As noted earlier, the shift of data managment in 1977 caused certain discontinuties, particularly in incidence. Therefore, incidence rates are calculated only for 1978 onward. These estimated incidence rates show that, for most reported causes of renal failure, there was little change in reported incidence rates in the 3-year period 1978-1980. Among the more common diagnoses, glomerulonephritis rose slightly from 15 per million to 16 per million (despite the fact that glomerulonephritis continues to decline as a percent of new cases), while both polycystic kidney disease and other interstitial nephritis remained constant at 5 per million.

The two exceptions were primary hypertensive disease and diabetic nephropathy, both of which rose markedly. Primary hypertensive disease rose from 16 per million to 19 per million, a 19-percent increase, while diabetic nephropathy rose from 13 per million to 18 per million, a 38-percent rise in incidence.

Table 8 presents the percent distribution of 1980 reported primary diagnosis broken into 8 age categories. The table shows that the distribution of diagnoses varies greatly by age group. For the youngest age group, 37 percent are coded as glomerulonephritis, followed by 20 percent unspecified, and 18 percent with obstructive uropathy, congenital. None had primary hypertensive disease and less than 1 percent had diabetic nephropathy. Among the 25-34 year olds, the two major causes of renal failure were glomerulonephritis and diabetic nephropathy, both with about 31 percent.

In the older age groups, primary hypertensive disease increased in importance to the point of being the number one reported cause of renal failure among persons 65 years of age and over.

Diagnostic specific incidence rates by age present a slightly different perspective, as shown in Table 9. Glomerulonephritis rises steadily with age from 3 per million for persons 0-14 years of age to 35 per million for persons 65-74 years of age. Primary hypertensive disease has a similar but steeper increase, rising from 0 incidence in the youngest age group to a rate in the group 65-74 years of age that is double (70 per million) that of glomerulonephritis. Diabetic nephropathy tends to peak a little more to the center of the age distribution. Its highest rate appears in the 55-64 age range (53 per million) although it is the most commonly reported cause of renal failure in the three groups 35-44, 45-54, and 55-64 years of age.

The incidence rates in 1980 by diagnosis are shown by sex in Table 10. Overall, males had an incidence rate that was 25 per million higher than females (95 per million and 70 per million, respectively). Most of this difference can be attributed to higher rates of glomerulonephritis and primary hypertensive disease. Males were also slightly more likely to have diabetic nephropathy. In two diagnostic categories, collagen vascular disease and other interstitial nephritis, females had higher incidence rates than males.

Table 11 presents the incidence rates by diagnosis by race. It is immediately evident that primary hypertensive disease is much more likely to be reported as the cause of renal failure among black people (43 percent) than among either white people (17 percent) or all other people (14 percent). This should be interpreted with some caution, however. It has been suggested

that there is the possibility that physicians, when faced with a black renal patient who is hypertensive, are more likely to attribute the renal failure to hypertension than when faced with a white hypertensive patient. Nevertheless, it appears that there are distinctly different patterns of renal failure by race. Black people have a reported rate of renal failure resulting from hypertension that is 6.5 times as great as for white people and 4 times as great as for all other people. This discrepancy in hypertensive renal failure is far greater than would be predicted based on the 65-percent higher rate of hypertension among black people cited earlier (Rowland and Roberts, 1982). The reason for this is not clear. Part of it could be from the presumed tendency of physicians to categorize renal failure among black people as resulting from hypertension. Another possibility is that hypertension is more severe among black people and has the more severe outcome of renal failure in a greater number of cases.

Table 11 also shows strong race relationships for glomerulonephritis and diabetic nephropathy. Glomerulonephritis as a cause of renal failure is nearly twice as common among black people (26 per million) than among white people (14 per million), and the rate among all other people is 2.3 times that of the white rate. For diabetic nephropathy, the rate among black people and other races is approximately 3 times the rate among white people. As with hypertension, the racial difference in incidence as a result of diabetic nephropathy is in the expected direction but is of a greater magnitude than would have been predicted by rates of diabetes alone. The rate of diabetes among black people is 50 percent greater than among white people, and other races have a rate that is 69 percent greater than the rate for white people. (NCHS, 1979)

ESRD Program Survival Analyses

This section describes the program experience with respect to patient survival from onset of renal failure. The analysis covers the period from July 1973 through December 1979, a 6 1/2-year time period. All persons with renal failure occurring after June 30, 1973, and before January 1, 1980, who were Medicare entitled were included in the analysis. The total number of persons included in the computation of survival rates was 74,547.

Survival rates were calculated using a standard modified life-table analysis (Cutler and Ederer, 1958). For each interval (each successive year following renal onset), the number of deaths occurring during the interval was divided by the number of persons exposed to risk to obtain the survival rate. The cumulative survival rate is simply the product of successive yearly survival rates.

These survival analyses are limited to the patients treated by dialysis only; transplanted patients have been deleted from the analyses. Transplant patients lose their entitlement to Medicare benefits after 3 years if their graft continues to function. Thus, it is virtually impossible to track these patients for more than 3 years post transplant. Therefore, it was decided to emphasize the dialysis population, the group for whom survival can be estimated over the long term. One limitation to this analysis is the problem of unidentified transplant patients. Many transplant patients could not be identified as such because of the under-reporting of the transplant incidence form (HCFA 600-1). Since patients receiving transplants have higher survival rates than dialysis patients, these analyses will be biased upward to some extent (i.e., estimates of patient survival will be higher than the "true" survival on dialysis). A sensitivity analysis was

performed and showed that the effect of the inclusion of unidentified transplant patients in the calculation of dialysis survival rates could bias results upward by 1 or 2 percent for the age groups under 55 years of age. There is essentially no bias in the older age groups because these patients so rarely receive transplants.

Table 12 presents the results of the survival analysis for all Medicare persons with ESRD on dialysis. Eighty-one percent of all persons survived for 1 year after onset of kidney failure. The probability of survival shows a slight upward trend with each succeeding year of survival. For example, for persons who have survived 2 years, the probability of surviving an additional year is 85 percent; for those surviving 5 years the probability of surviving through the sixth year is 89 percent.

One of the strongest determinants of survival among ESRD Medicare beneficiaries is the age of the beneficiary at renal onset. For the youngest group (0-14 years of age), first-year survival is 84 percent. Second-year survival rises to 88 percent and survival in subsequent years is greater than 90 percent. Survival is highest for the group 15-24 years of age. Eighty-eight percent survive the first year and survival in subsequent years is more than 90 percent. Patients in the next three age groups (25-34, 35-44, and 45-54 years of age) have year-to-year survival rates that start in the mid-80-percent range and improve in later years to about 90 percent. Survival is lowest for the oldest age groups. Persons 65-74 years of age have a first-year survival of 74 percent. This improves to slightly more than 80 percent by the fourth year. Similarly, the oldest group (75 years of age or over) experience a 64-percent survival in the first year which improves to more than 80 percent by the fourth year.

The cumulative effect of yearly survival rates is presented in Table 13 and illustrated in Figure 2. The net effect of yearly survival rates of 81 percent to 89 percent (for all persons) is a rapidly declining cohort. About two-thirds (67 percent) of all patients can be expected to live for 2 years after the onset of renal failure. Fifty percent will survive for 4 years and, by the end of 6 1/2 years, only 37 percent of ESRD beneficiaries can be expected to live.

At first glance, cumulative survival by age is striking. The highest survival is found in the 15-24 age group where 61 percent survive for 6 1/2 years. By the end of the 6 1/2 year time period, 57 percent of the 0-14 age group can be expected to survive. This cumulative survival rate decreases steadily for the older age groups. For the group over 75 years of age, only 16 percent can be expected to survive 6 1/2 years. Thus, relative to other persons with ESRD, persons 0-14 and 15-24 years of age have the highest survival rates. As will be shown below, most of these differences by age are attributable to underlying age mortality irrespective of renal disease.

Despite these findings, relative to the death rate experienced by the total population in their own age group, the younger age groups' survival experience is much worse. Table 14 shows 5-year death rates by age for the ESRD population and for the entire U.S. population. Among the general U.S. population under age 35, death is a rare event. Less than 1 percent of persons in these age groups can be expected to die over a 5-year period. By contrast, 36-44 percent of persons with ESRD in the three youngest age groups can be expected to die during a 5-year period. Thus, the excess mortality of ESRD persons in these age groups is quite high. The mortality rate for ESRD persons in the youngest three age groups

is 60 to 80 times as great as all persons of the same age. This relative mortality decreases for the older groups. Thus, while the oldest age group of ESRD beneficiaries (75 years of age or over) has a mortality rate of 70 percent over 5 years, this is three times as great as the mortality rate for all persons in this age group.

Table 14 also shows ESRD mortality expressed in absolute differences from the total population rates as opposed to ratios. This provides a somewhat different perspective. Excess 5-year mortality for the youngest two age groups is 39 percent and 37 percent, respectively. This excess mortality increases with each advancing age group up to 64-74 years of age, at which point there is a 55-percent excess mortality for ESRD persons. Excess mortality then drops slightly for persons 75 years of age or over to about 47 percent.

The preceding analysis has shown that age at onset of renal failure has a strong effect on survival probabilities. Given this relationship, we decided to age adjust all subsequent analyses. This was done by adjusting (by the direct method) age-specific survivals for various subgroups to the age distribution of all ESRD persons (N = 74,547) included in the survival analyses.

Table 15 presents the results of age-adjusted survival analysis by sex and race. Females have a better survival pattern than do males. By the end of 6 1/2 years 39 percent of females with ESRD can be expected to survive, compared with 36 percent of males. This finding is consistent with the general relationship of sex to life expectancy. Among the general population, for instance, females have a life expectancy more than 7 years greater than males (76.7 years and 69.0 years, respectively). By age 65, female life expectancy is still 4.3 years longer than males (18.0 years and 13.7 years, respectively). Racial differences are not so striking.

Black people have the highest 6 1/2 year cumulative survival at 39 percent. This is followed by all other people at 38 percent and white people at 36 percent.

Among the different ESRD populations which could have different prognoses for survival are persons with different causes for renal failure. Table 16 presents the results of the age-adjusted survival analysis for various primary diagnoses. It is apparent that the reported cause of renal failure is an important determinant of survival. The best survival experience is shown by persons with polycystic kidney disease, with 52 percent surviving for 6 1/2 years.

A number of categories group at the 40-percent range for 6 1/2 year survival. These include glomerulonephritis (41 percent), primary hypertensive disease (40 percent), other interstitial nephritis (42 percent), and etiology unknown (39 percent). The worst 6 1/2 survival is experienced by persons whose reported cause of renal failure is collagen vascular disease (30 percent) and persons with diabetic nephropathy (17 percent). This analysis illustrates some of the impact a changing case mix is likely to have on the ESRD population. For instance, the rapid rise in treatment for persons whose renal failure is from diabetic nephropathy should be accompanied by a less rapid growth in program enrollment.

It is also of interest to know if the survival of ESRD beneficiaries has changed during the course of the program. Table 17 shows the first-year survival rates of Medicare ESRD beneficiaries by age at renal failure onset for each years' cohort of new patients. It appears that the greatest progress in patient survival has occurred at the extremes of the age distribution. In 1974, there was a 78-percent survival for persons 0-14 years of age. By 1979, this had risen to 90 percent. Persons 15-24 years of age at renal failure

onset had a 6-percent increase in survival from 86 percent to 92 percent. For persons 75 years of age or over, the first year's survival increased from 52 percent in 1974 to 65 percent in 1979. These three age groups, however, account for only 12 percent of all new ESRD patients. The majority of the ESRD population did not experience a large increase in survival. The two groups 55-64 and 65-74 years of age actively had a slight decline in first-year survival during this 6-year period. These two age groups accounted for 46 percent of all new patients during these years. The net result is that there has been little change in aggregate survival for the ESRD population. From 1974 through 1977, the first-year survival remained constant at 81 percent. It rose by 1 percent each of the last 2 years to 83 percent in 1979. Future analyses will show whether this represents a trend or is a short-term deviation in the survival rate.

ESRD Program Enrollment (Prevalence)

Table 18 shows the number of Medicare enrollees with ESRD (prevalence) by age, sex, and race for the years 1974-81. In 1974, there were nearly 16,000 such persons entitled to Medicare. By 1981, this had risen to a little more than 64,000, an increase of 300 percent. This represents an annual increase of almost 22 percent. The increase has not been uniform across all groups however. By age, the largest increases have come in the 25-34 and 55-64 age groups, both with annual increases of 25 percent or more. The 15-24 and 65 or over age groups had annual increases of a little less than 20 percent. Not much difference was found in the rate of growth for males

and females, although the rate for females was slightly higher. With regard to race, the all other population grew faster than the white population.

The differential increases have produced small changes in the composition of the ESRD population. Females have increased from 43 percent of the treated population in 1974 to 45 percent in 1981, and black people have increased from 22 percent to 25 percent.

It is interesting to note that the increase in the covered population has not progressed at a uniform rate (Table 19). In the year between 1974 and 1975, there was a 42-percent growth in the population. Increases in the subsequent 3 years ranged from 20 percent to 28 percent. Then, in the most recent 3 years, the rate of growth has slowed to below 20 percent and has reached a low of 11 percent in the most recent year (1980 to 1981). This general pattern of a slowing in growth is evident across all age, sex, and race groups. The pattern of a rapidly growing program which gradually tapers off is to be expected with a program such as ESRD. Before Medicare funding, when rationing of scarce dialysis resources was the rule, the ESRD population did not grow because the vast majority of ESRD patients could not get services and died. With the implementation of the program, these patients received care and lived 2, 3, 4, 5, or more years, thus increasing the population markedly. Eventually, an equilibrium point is likely to be reached in which new entrants to the the program are balanced by deaths. However, as will be illustrated in a following analysis, the changing demographic characteristics of the U.S. population make it unlikely that an equilibrium point will be reached in the near future.

The prevalence of Medicare ESRD coverage per million population in the United States is shown in Table 20. Comparing the prevalence rates across demographic characteristics, one sees the importance of age as a correlate of renal failure. By 1981, in the youngest group 0-14 years of age, only 16 persons per million population were Medicare ESRD patients. This rate jumps almost sixfold in the next age group, 15-24, to 93 per million. The rate of Medicare covered ESRD persons continues to increase with age up to the 55-64 age group with over 650 Medicare ESRD beneficiaries per million population. This rate remains essentially the same for the 65 years of age or over group. Males have a prevalence rate that is 28 percent higher than females (322 per million and 251 per million, respectively). By race, it can be seen that black people have a prevalence rate of 658 per million, which is 2.9 times that of white people (231 per million). Persons of all other races have a prevalence rate that is 90-percent higher than that for white people (437 per million).

Given the changing incidence rates by diagnosis, it is also interesting to examime prevalence rates by diagnosis. Changes in diagnostic prevalence will take place more slowly than incidence, because survivors from previous incidence distributions will mute changes in recent incidence. Table 21 shows the Medicare ESRD program prevalence by diagnostic category. As expected, there has been less change than in incidence rates. Persons with glomerulonephritis have decreased from 35 percent of the total to 29 percent from 1974 through 1981. Primary hypertensive disease has increased only 4 percent, from 14 percent to 19 percent of the total renal population.

Finally, despite the large increase in incidence, persons with diabetic nephropathy have only increased by about 4 percent (7.7 percent to 11.8 percent). This is because of not only the inherent lag of prevalence behind incidence but to the fact that persons with diabetic nephropathy have considerably lower survival rates than other renal failure persons. Table 22 shows how the percent distribution of diagnoses translates into rates per million. All diagnostic categories experienced an increase prevalence from 1974 to 1981. Among the major categories, diabetic nephropathy had the largest increase in prevalence, 6 per million to 34 per million, a 4.7 fold increase. Primary hypertensive disease also increased by more than a factor of 4 (10 per million to 54 per million). Glomerulonephritis increased by a factor of 3.2, from 26 per million to 82 per million and remains the largest single diagnostic category of ESRD patients.

Future Program Growth

Given the observed rates of incidence and survival and the current enrollment of the Medicare ESRD program, it is possible to project the potential growth of this program. It has been widely reported that the American population will undergo a large shift in its age structure during the next 50 years (U.S. Bureau of Census, 1977). From 1980 to 2030, the Census Bureau projects an increase in total population of 35 percent, reflecting a 28-percent increase in the white population and an 83-percent increase in the all other group population. Concurrently, there will be a very large increase in older Americans, those most susceptible to renal failure.

The number of Americans 65 years of age and over is expected to increase by 121 percent by the year 2030. These population trends will have a direct impact on the Medicare ESRD program as shown in the next analysis.[4]

We used the 3-year average ESRD incidence rates (as shown in Table 3) and average ESRD termination rates over the same time period in conjunction with census population projections to calculate future Medicare ESRD enrollments. Terminations are the sum of deaths and termination of Medicare benefits, usually because of successful transplantation. The estimates are based on three assumptions: unchanging incidence rates for all age, sex, and race groups; unchanging termination rates; and accurate census projections. If incidence rates rise, then the projections will be too low. To the extent that improvements in transplant success are made or decreases in mortality rates are achieved, the estimates will change accordingly.

Table 23 presents the estimates of Medicare ESRD program enrollment for the years 1980 through 2030 by age, sex, and race categories. Total ESRD enrollment is estimated to rise from 57,800 in 1980 to 162,100 in 2030, an increase of 180 percent. Under the stated assumptions, male enrollment will increase by 176 percent and female enrollment by 186 percent, white enrollment will increase by 118 percent and all other enrollment will increase by 327 percent. The large increase among all other race

[4] The following analysis does not constitute an official HCFA projection of ESRD Medicare enrollment. These projections were done in HCFA's Office of Research. Official HCFA projections are routinely produced by the Office of Financial and Actuarial Analysis in HCFA.

groups is not only because of their total growth relative to that for white persons but also because of a greater relative shift from young to old among this group. Finally, the greatest increase by age will be among the 0-24 age group (279 percent) and the smallest enrollment increase will be among the aged (100 percent). The reason that the aged enrollment will not increase to a greater extent, despite the large increase in total population, is the much higher mortality rates among aged ESRD Medicare beneficiaries. The mortality rates for the over 65 ESRD population are more than twice as great as for the under 25 age group. A second reason is that most of the increase in the over 65 population will occur in the "older aged", those 75 years of age or over. And, as was shown, treated incidence declines rapidly after 75 years of age.

Figure 3 illustrates the projected growth in the ESRD Medicare population. The effect of the post-World War II baby boom is evident in this graph. Most of the growth in the 0-24 and 24-44 age groups will occur by the year 2000, after which it will level off somewhat. The 45-64 age group will start to experience its greatest growth between the year 2000 and 2015 as the baby boom segment of the population reaches this age range. Finally, as the baby boom population exits the 45-64 age group and enters the 65 years of age or over group range (around 2015), there will be a subsequent rise in the 65 years of age or over ESRD population.

It should be noted that, in spite of the seemingly large increase in total ESRD enrollment compared with the growth in the U.S. population, this projection does reflect a continuation of the decrease (shown in Table 20) in percentage growth of the beneficiary population. From 1980 to 1990, the

projected annual growth rate is only 5 percent. In subsequent decades, it declines even further so that for the decade 2020 to 2030 the projected annual growth rate is less than 1 percent. Thus, the rate of growth in program enrollment is likely to level off even if absolute enrollment continues to grow.

This estimate of future ESRD population growth is markedly different from previous estimates that had the population leveling off at around 90,000 (Iglehart, 1981; Klar, 1972; Kolata, 1980). The major differences between this and other projections are first, higher incidence rates than previously suspected, and second, the factoring of the aging of the overall population into the model. Also, the Office of Financial and Actuarial Analysis in HCFA never predicted a leveling off of program enrollment. Many authors apparently assumed that the actuaries' projection indicated level off points. Nevertheless, this projection is likely to be a conservative estimate of future enrollment. It appears that incidence rates are not remaining unchanged but in fact may be increaseing (see Table 3). If this is so, then future Medicare ESRD enrollment will be greater than estimated in Table 23.

SUMMARY AND CONCLUSIONS

The analyses presented in this paper bring to light several aspects of the Medicare ESRD program. First, program enrollment has been, and continues to be, growing rapidly. From 1974 through 1981, program enrollment quadrupled. Although this is a cause of concern to policymakers and legislators who must deal with escalating program costs, it is also a measure of the program's success. Prior to Medicare funding of ESRD services, thousands of persons each year died because there was no funding source for dialysis and transplantation. The 64,000 persons covered by the program as of 1981 represent the truly life-saving accomplishments of this program. It is important to note as well that the program is growing at a declining rate. Yearly increases in the early days of the program regularly exceeded 20 percent. That growth rate has now dropped to a little more than 10 percent.

A second finding is that, given the demographic characteristics of ESRD program incidence and the projections of the U.S. population, there is no reason to expect that program enrollment will level off during the immediate future. In fact, the recent incidence and mortality experience suggest the program will continue to grow with a 180-percent increase in enrollment during the next 50 years, although the growth rate is likely to continue to drop. However, the aging of the U.S. population and the projected relative increase in the U.S. population of all races other than white will combine to push program enrollment higher.

A third important finding is the changing mix of new entrants into the program. Program incidence continues to rise, a fact which underlines the conservative nature of the projections of future enrollments. The

increase in incidence is higher among females and among all races other than white. In terms of diagnoses, the biggest increases in incidence are for persons whose reported cause of renal failure is either primary hypertensive disease or diabetic nephropathy.

A fourth finding concerns the complex relationship between age, sex, and race and ESRD program incidence. The fact that sex and race differences in incidence do not appear until adulthood underscores the potential benefits that prevention could have on this program. To the extent that diabetes and hypertension can be controlled, there could be substantial residual benefits in terms of lower incidence of renal failure.

The survival analyses showed that, for all the life-saving benefits of dialysis, end-stage renal disease remains a serious life-threatening disease. Less than one-half of persons with renal failure can expect to survive 5 years. Age is a significant factor in survival, with persons 15-24 years of age having a 64-percent, 5-year survival rate, while persons 75 years of age or over have a 5-year survival of only 22 percent. Much of this difference, however, is because of underlying age-specific mortality. Adjusting for overall mortality rates reduces much of the apparent age impact on ESRD survival.

Race does not appear to be a significant factor in survival in the population. Sex is a small factor, with females surviving at a rate 3 percent greater than males. A critical determinant of survival is the principle cause of renal failure. Persons whose renal failure was polycystic kidney disease have the best survival experience, while those with diabetic nephropathy have the worst.

In summary then, this paper describes a program in flux. It is still growing but with a changing patient population. This study should be updated in the future to determine if current trends in incidence, prevalence, and mortality are continuing. In particular, the increasing incidence rate is a real cause of concern. Presumably it will stabilize at some level. However, it has exceeded initial expectations by a considerable amount and, as yet, there is little indication that a leveling off is occurring.

Additional work should also be done relating case mix to the various treatment therapies. For instance, studies have shown that black people have kidney transplants proportionately less frequently than white people. Is this changing and if so, in what direction? Continuous ambulatory peritoneal dialysis has grown tremendously in the last few years. Which age, sex, race, and diagnostic groups are using this therapy? Home and facility hemodialysis are very much alternative therapy options for many people. How does the changing age structure of the ESRD population affect the prospects for home dialysis? How does it affect the prospects for increased transplantation?

Further studies need to be done relating treatment outcomes such as survival to the various treatment therapies. The work reported here shows that such studies need to control for case-mix differences in age, sex, and diagnosis.

Finally, further studies on the Medicare ESRD population need to take account of emerging technological changes in ESRD therapy and monitor their impacts on the population. A good example is the future use of cyclosporin

as an immunosuppressant in post transplant therapy. Early evaluations of this drug suggest that its use could greatly increase graft survival rates. If so, this could have a big impact on program enrollment as increasing numbers of persons could leave the program as essentially "cured" end-stage renal disease patients.

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Table 1: Medicare ESRD Program Incidence by age, sex and race, 1978-1980

	1978	1979	1980	Pct. Change 1978 -1980
TOTAL	15584	17243	18279	17%
Age:				
0-14	309	302	345	12%
15-24	1076	1069	1013	-6%
25-34	1793	1885	2088	16%
35-44	2076	2113	2221	7%
45-54	2789	3107	3097	11%
55-64	3580	4034	4334	21%
65-74	3096	3496	3739	21%
75+	865	1237	1442	67%
Sex:				
Male	8755	9658	10256	17%
Female	6829	7584	8023	17%
Race:				
White	10725	11568	12418	16%
Black	3935	4593	4680	19%
All Other	464	535	601	30%
Unknown	460	547	580	26%

Table 2: Medicare ESRD Program Incidence Rates Per Million Population, by age, sex and race, 1978-1980

	1978	1979	1980	Pct. Change 1978 - 80
TOTAL	71	78	82	15%
Age:				
0-14	6	6	7	17%
15-24	26	26	24	-8%
25-34	53	54	58	9%
35-44	85	84	86	1%
45-54	120	135	136	13%
55-64	173	193	204	18%
65-74	208	230	241	16%
75+	96	134	153	59%
Sex:				
Male	82	90	95	16%
Female	61	67	70	15%
Race:				
White	59	63	67	15%
Black	159	184	185	16%
All Other	118	131	140	19%

Table 3: Medicare ESRD Program Incidence Rates Per Million Population by age, sex and race, 1978-1980 Average

	All Persons			White			All Others		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
TOTAL	77	89	66	63	74	52	169	186	154
Age:									
0- 4	3	3	2	3	4	3	2	3	2
5- 9	6	7	6	6	7	6	6	7	5
10 14	13	13	12	12	13	12	14	16	13
15-19	21	23	19	19	21	17	30	32	27
20-24	32	37	28	28	31	24	57	70	46
25-29	46	55	37	38	44	31	94	122	70
30-34	61	75	47	48	58	39	143	196	99
35-39	76	95	58	59	72	46	196	266	138
40-44	95	116	75	71	86	56	263	340	199
45-49	119	140	99	88	105	72	345	413	286
50-54	145	164	127	107	125	91	440	492	396
55-59	174	197	153	130	153	109	547	586	514
60-64	204	234	177	157	190	129	616	639	597
65-69	220	265	183	175	224	135	633	646	623
70-74	218	279	173	179	243	132	591	609	576
75-79	183	256	136	154	228	107	496	532	469
80-84	128	201	87	111	183	72	310	372	268
85+	43	84	25	40	82	21	71	99	56

ESRD PROGRAM INCIDENCE, BY AGE, SEX, AND RACE: 1978-1981

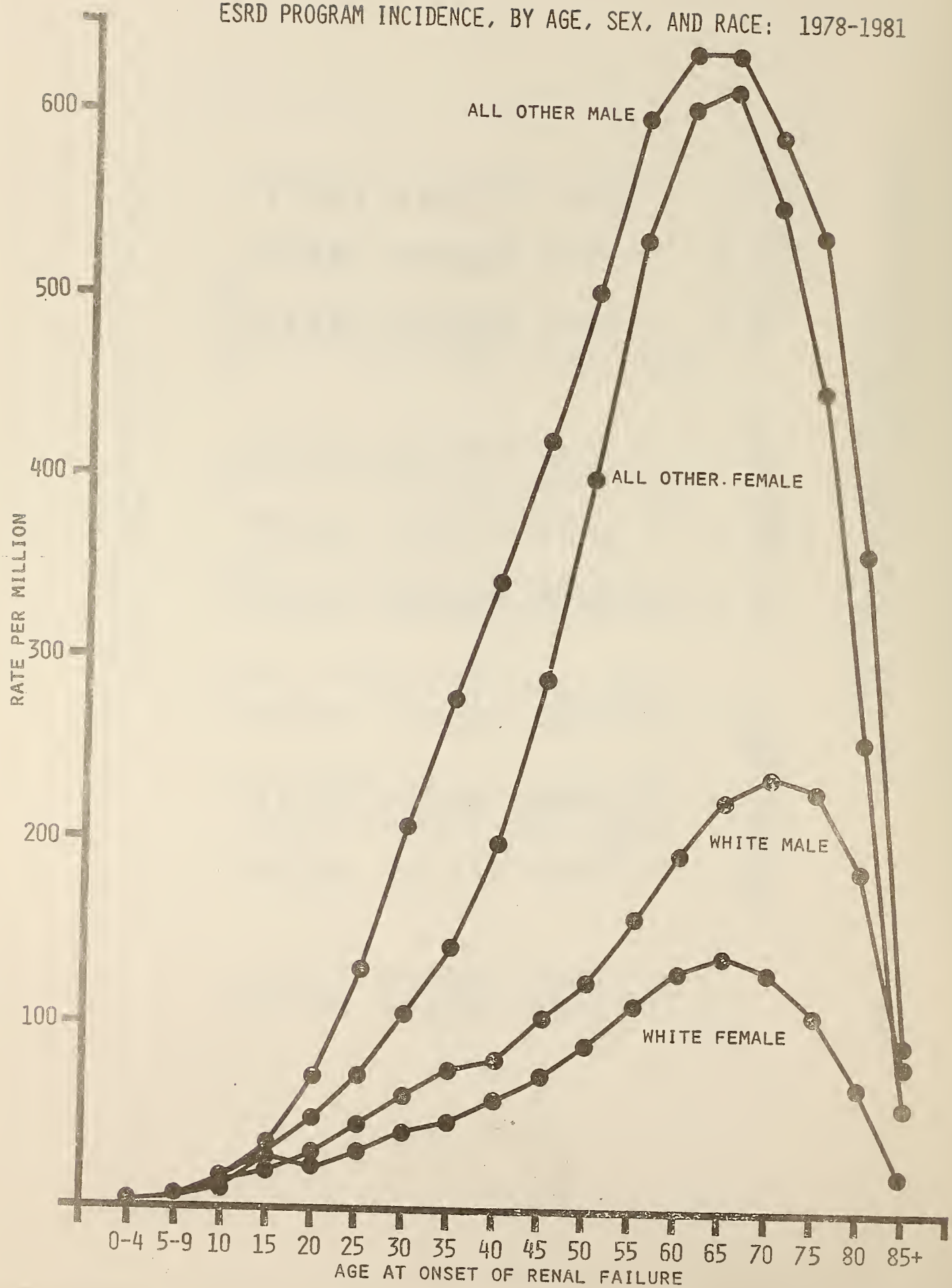


Table 4: Medicare ESRD Program Incidence by State, All Persons and White Persons Over Age 65, 1978 to 1980 Average

	ALL PERSONS			WHITE, AGE 0-64		
	1978 Population in 1,000"s	Average Annual ESRD Incidence	ESRD Incidence Per Million	1978 Population in 1,000"s	Average Annual ESRD Incidence	ESRD Incidence Per Million
Alabama	3742	362.0	97.	2355	152.7	65.
Alaska	403	10.3	26.	257	8.0	31.
Arizona	2354	210.3	89.	1701	125.3	74.
Arkansas	2244	128.3	57.	1446	71.7	50.
California	22294	1830.7	82.	16529	935.7	57.
Colorado	2671	168.3	63.	2165	120.7	56.
Connecticut	3099	217.3	70.	2580	121.7	47.
Delaware	583	48.3	83.	444	25.3	57.
District of Columbia	674	125.0	185.	152	9.7	64.
Florida	8594	921.0	107.	5457	381.7	70.
Georgia	5084	482.0	95.	3256	178.3	55.
Hawaii	897	86.7	97.	307	17.0	55.
Idaho	878	38.3	44.	684	29.3	43.
Illinois	11243	807.3	72.	8585	402.7	47.
Indiana	5374	325.3	61.	4416	205.0	46.
Iowa	2915	155.3	53.	2460	116.0	47.
Kansas	2348	118.3	50.	1873	72.7	39.
Kentucky	3518	197.7	56.	2748	124.3	45.
Louisana	3966	326.7	82.	2377	107.7	45.
Maine	1091	46.3	42.	910	35.3	39.
Maryland	4143	315.7	76.	2986	128.3	43.
Massachusetts	5774	405.0	70.	4927	225.3	46.
Michigan	9189	627.7	68.	7247	304.0	
New Jersey	7327	709.3	97.	5748	332.7	58.
New Mexico	1212	96.7	80.	913	54.7	60.
New York	17748	1457.3	82.	13842	665.0	48.
North Carolina	5577	455.3	82.	3712	180.0	48.
North Dakota	652	33.7	52.	544	25.0	46.
Ohio	10749	710.0	66.	8731	418.7	48.
Oklahoma	2880	189.0	66.	2072	111.3	54.
Oregon	2444	118.0	48.	1913	87.7	46.
Pennsylvania	11750	938.7	80.	9519	514.0	54.
Rhode Island	935	78.3	84.	828	42.3	51.
South Carolina	2918	237.7	81.	1722	80.7	47.
South Dakota	690	36.7	53.	557	22.7	41.
Tennessee	4358	305.7	70.	3082	156.3	51.
Texas	13092	1053.3	80.	9326	540.0	58.
Utah	1308	69.0	53.	1039	53.7	52.
Vermont	487	28.3	58.	413	19.7	48.
Virginia	5150	481.0	93.	3591	193.7	54.
Washington	3774	217.7	58.	2945	149.7	51.
West Virginia	1860	113.0	61.	1518	79.0	52.
Wisconsin	4679	295.7	63.	3877	196.3	51.
Wyoming	424	15.3	36.	311	10.7	34.
U.S. Total	220,276	17,035.3	77.	168,088	8,593.7	51.

Table 5: Distribution of States by Medicare Program Incidence Rates, 1978-1980 Average

Rate Per Million	All Persons	White, Age 0-64
	Number of States	
20-29	1	0
30-39	1	4
40-49	4	23
50-59	12	18
60-69	8	3
70-79	5	3
80-89	13	0
90-99	5	0
100+	2	0
TOTAL	51	51

U.S. Total:

All Persons = 77 Per Million
White, 0-64 = 51 Per Million

Table 6: Percent Distribution of Primary Diagnosis For Newly Entitled ESRD Persons 1973 to 1980

DIAGNOSIS	1973 and Prior	1974	1975	1976	1977	1978	1979	1980
ALL CAUSES	100%	100%	100%	100%	100%	100%	100%	100%
Glomerulonephritis	36.4	29.2	27.1	24.7	23.5	21.7	21.0	19.7
Primary Hypertensive Disease	13.2	13.9	15.0	15.8	20.4	22.2	22.1	23.4
Diabetic Nephropathy	7.0	11.9	12.2	14.0	15.8	18.0	18.7	21.8
Polycystic Kidney Disase	8.7	7.5	6.5	7.0	6.7	6.4	6.1	5.9
Collagen Vascular Disease	1.5	2.0	1.8	1.8	1.3	1.7	1.4	1.4
Interstitial Nephritis, Hereditary	1.5	1.4	1.0	1.6	1.2	.7	1.0	1.0
Interstitial Nephritis, Other	12.5	10.4	10.0	9.4	7.2	6.6	6.7	6.4
Analgesic Abuse Nephropathy	*	.1	*	.2	1.0	1.0	1.2	1.1
Obstructive Uropathy, Acquired	.3	.2	.1	.4	2.2	2.5	2.5	2.4
Obstructive Uropathy, Congenital	.1	.1	.1	.5	1.5	1.3	1.5	1.1
Amyloidosis	*	*	*	.1	.5	.6	.4	.5
Multiple Myeloma	.1	*	.1	.1	.8	1.0	1.0	1.0
Gouty Nephropathy	*	*	*	*	.3	.3	.3	.5
Other, Unspecified	9.4	12.5	13.3	12.1	7.8	6.5	6.1	5.0
Etiology Unknown	9.0	11.0	12.8	12.4	9.6	9.5	10.1	8.8
Number of Persons	13,320	6,553	6,805	6,245	7,226	7,505	8,315	9,310

* Less than .1 percent.

Table 7: Medicare ESRD Program Incidence Rate Per Million Population by Primary Diagnosis, 1978-1980

DIAGNOSIS	1978	1979	1980
ALL CAUSES	71	78	82
Glomerulonephritis	15	16	16
Primary Hypertensive Disease	16	17	19
Diabetic Nephropathy	13	15	18
Polycystic Kidney Disase	5	5	5
Collagen Vascular Disease	1	1	1
Interstitial Nephritis, Hereditary	*	1	1
Interstitial Nephritis, Other	5	5	5
Analgesic Abuse Nephropathy	1	1	1
Obstructive Uropathy, Acquired	2	2	2
Obstructive Uropathy, Congenital	1	1	1
Amyloidosis	*	*	*
Multiple Myeloma	1	1	1
Gouty Nephropathy	*	*	*
Other, Unspecified	5	5	4
Etiology Unknownn	7	8	7

* Less than one per million.

Table 8:

Medicare ESRD Program Incidence by Diagnosis by age, 1980;
Percent Distributions

	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75+
DIAGNOSIS								
ALL CAUSES	100%	100%	100%	100%	100%	100%	100%	100%
Glomerulonephritis	37.2	40.0	30.7	24.0	17.6	15.2	14.6	12.6
Primary Hypertensive Disease	0.0	5.9	11.9	20.0	24.4	25.0	29.1	36.7
Diabetic Nephropathy	0.7	5.5	30.8	28.1	24.3	25.9	17.4	10.4
Polycystic Kidney Disase	6.6	1.1	2.3	7.5	10.7	7.4	4.5	2.0
Collagen Vascular Disease	2.2	4.7	2.5	2.1	1.4	0.6	0.8	0.4
Interstitial Nephritis, Hereditary	2.9	4.4	2.2	0 9	0.5	0.7	0.3	0.4
Interstitial Nephritis, Other	4.4	8.1	5.1	4.1	5.6	6.6	7.1	9.3
Analgesic Abuse Nephropathy	0.0	0.2	0.1	1.3	1.2	1.7	1.3	0.2
Obstructive Uropathy, Acquired	0.7	1.1	0.7	0.4	1.4	2.4	4.2	5.8
Obstructive Uropathy, Congenital	18.2	9.1	2.0	0.6	0.1	0.1	0.1	0.0
Amyloidosis	0.0	0.0	0.0	0.4	0.7	0.7	0.8	0.5
Multiple Myeloma	0.0	0.0	0.0	0.4	0.6	1.3	1.9	2.1
Gouty Nephropathy	0.7	0.2	0.2	0.2	0.7	0.5	0.6	0.7
Other, Unspecified	20.4	13.1	6.4	3.6	3.5	4.3	12.7	4.2
Etiology Unknown	5.8	6.6	5.2	6.5	7.2	7.7	4.4	14.6
Number of Persons	137	472	1060	1113	1530	2126	2065	807

Table 9: Medicare ESRD Program Incidence Per Million Population by Diagnosis by age, 1980

DIAGNOSIS	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75+
ALL CAUSES	7	24	58	86	136	204	241	153
Glomerulonephritis	3	10	18	21	24	31	35	19
Primary Hypertensive Disease	0	1	7	17	33	51	70	56
Diabetic Nephropathy	*	1	18	24	33	53	42	16
Polycystic Kidney Disase	*	*	1	6	15	15	11	3
Collagen Vascular Disease	*	1	1	2	2	1	2	1
Interstitial Nephritis, Hereditary	*	1	1	1	1	1	1	1
Interstitial Nephritis, Other	*	2	3	4	8	13	17	14
Analgesic Abuse Nephropathy	0	*	*	1	2	3	3	*
Obstructive Uropathy Acquired	*	*	*	*	2	5	10	9
Obstructive Uropathy Congenital	1	2	1	1	*	*	*	0
Amyloidosis	0	0	0	*	1	1	2	1
Multiple Myeloma	0	0	0	*	1	3	5	3
Gouty Nephropathy	*	*	*	*	1	1	1	1
Other, Unspecified	1	3	4	3	5	9	31	6
Etiology Unknownn	*	2	3	6	10	16	11	22

* Less than one per million.

Table 10:

Medicare ESRD Program Incidence by Diagnosis by sex, 1980

DIAGNOSIS	Percent Distribution Male	Percent Distribution Female	Incidence/Million Male	Incidence/Million Female
ALL CAUSES	100%	100%	95	70
Glomerulonephritis	21.5	17.3	20	12
Primary Hypertensive Disease	24.9	21.4	24	15
Diabetic Nephropathy	20.1	24.1	19	17
Polycystic Kidney Disase	5.2	6.8	5	5
Collagen Vascular Disease	0.5	2.5	*	2
Interstitial Nephritis, Hereditary	1.1	0.8	1	1
Interstitial Nephritis, Other	4.8	8.4	5	6
Analgesic Abuse Nephropathy	0.6	1.6	1	1
Obstructive Uropathy Acquired	3.5	1.1	3	1
Obstructive Uropathy Congenital	1.5	0.7	1	*
Amyloidosis	0.5	0.6	*	*
Multiple Myeloma	1.1	0.9	1	1
Gouty Nephropathy	0.6	0.3	1	*
Other, Unspecified	5.1	5.0	5	4
Etiology Unknownn	9.0	8.5	9	6

* Less than one per million.

Table 11: Medicare ESRD Program Incidence by Diagnosis by race, 1980

DIAGNOSIS	Percent Distribution White	Black	Other	Incidence/Million White	Black	Other
ALL CAUSES	100%	100%	100%	67	185	140
Glomerulonephritis	21.5	13.8	22.9	14	26	32
Primary Hypertensive Disease	17.4	42.5	14.0	12	79	20
Diabetic Nephropathy	21.5	21.6	31.2	14	40	44
Polycystic Kidney Disase	7.5	1.8	2.4	5	3	3
Collagen Vascular Disease	1.2	1.6	2.4	1	3	3
Interstitial Nephritis, Hereditary	1.3	0.2	0.0	1	*	0
Interstitial Nephritis, Other	7.2	4.0	6.5	5	7	9
Analgesic Abuse Nephropathy	1.2	0.6	1.0	1	1	1
Obstructive Uropathy, Acquired	2.8	1.3	3.1	2	2	4
Obstructive Uropathy, Congenital	1.5	0.2	0.3	1	*	*
Amyloidosis	0.7	0.2	0.3	*	*	*
Multiple Myeloma	1.3	0.5	0.0	1	1	0
Gouty Nephropathy	0.5	0.4	0.3	*	1	0
Other, Unspecified	5.8	2.7	5.5	4	5	8
Etiology Unknown	8.8	8.6	9.9	6	16	14

* Less than one per million.

Table 12: Year to Year Survival of Medicare ESRD Beneficiaries By age at Renal Failure Onset (Dialysis Patients Only) during period 1973-1979

Age at Onset	(N)*	Year From Onset 1	2	3	4	5	6
		Percent Surviving from Previous Year					
All Persons	(74,547)	81	83	85	88	88	89
0-14	(827)	84	88	91	93	97	95
15-24	(3,638)	88	90	91	93	96	95
25-34	(6,833)	86	86	89	91	93	93
35-44	(9,179)	86	85	88	91	91	91
45-54	(15,409)	85	85	86	87	85	89
55-64	(19,897)	83	82	84	84	85	88
65-74	(14,273)	74	77	79	82	81	83
75+	(4,491)	64	72	72	82	81	91

* The number of persons is the number of persons at risk at the beginning of the first year. Subsequent years are based on smaller numbers of cases.

Table 13: Cumulative Survival Rates of Medicare ESRD Beneficiaries By age at Renal Failure Onset (Dialysis Patients Only) during 1973-1979

Age at Onset	(N)*	Year From Renal Failure Onset[1] 1	2	3	4	5	6	6 1/2
		Percent Surviving						
All Persons	(74,547)	81	67	57	50	44	39	37
		(.1)	(.2)	(.2)	(.2)	(.3)	(.3)	(.3)
0-14	(827)	84	74	67	62	60	57	57
		(1.3)	(1.7)	(1.9)	(2.1)	(2.2)	(2.5)	(2.5)
15-24	(3,638)	88	79	72	67	64	61	61
		(.5)	(.7)	(.9)	(.9)	(1.0)	(1.2)	(1.2)
25-34	(6,833)	86	74	66	60	56	52	51
		(.4)	(.6)	(.7)	(.7)	(.8)	(.9)	(1.0)
35-44	(9,179)	86	73	64	58	53	48	46
		(.4)	(.5)	(.6)	(.6)	(.7)	(.8)	(.9)
45-54	(15,409)	85	72	62	54	46	41	39
		(.3)	(.4)	(.5)	(.5)	(.6)	(.6)	(.7)
55-64	(19,897)	83	68	57	48	41	36	33
		(.3)	(.4)	(.4)	(.5)	(.5)	(.6)	(.6)
65-74	(14,273)	74	57	45	37	30	25	23
		(.4)	(.5)	(.5)	(.6)	(.7)	(.9)	(1.1)
75+	(4,491)	64	46	33	27	22	20	16
		(.6)	(.8)	(.9)	(.9)	(1.5)	(2.2)	(3.7)

* The number of persons is the number of persons at risk at the beginning of the first year. Subsequent years are based on smaller numbers of cases.

[1] Standard errors are in parentheses.

FIG. 2 Cumulative Survival Rates of Medicare ESRD Beneficiaries, by age at Onset, Dialysis Patients Only

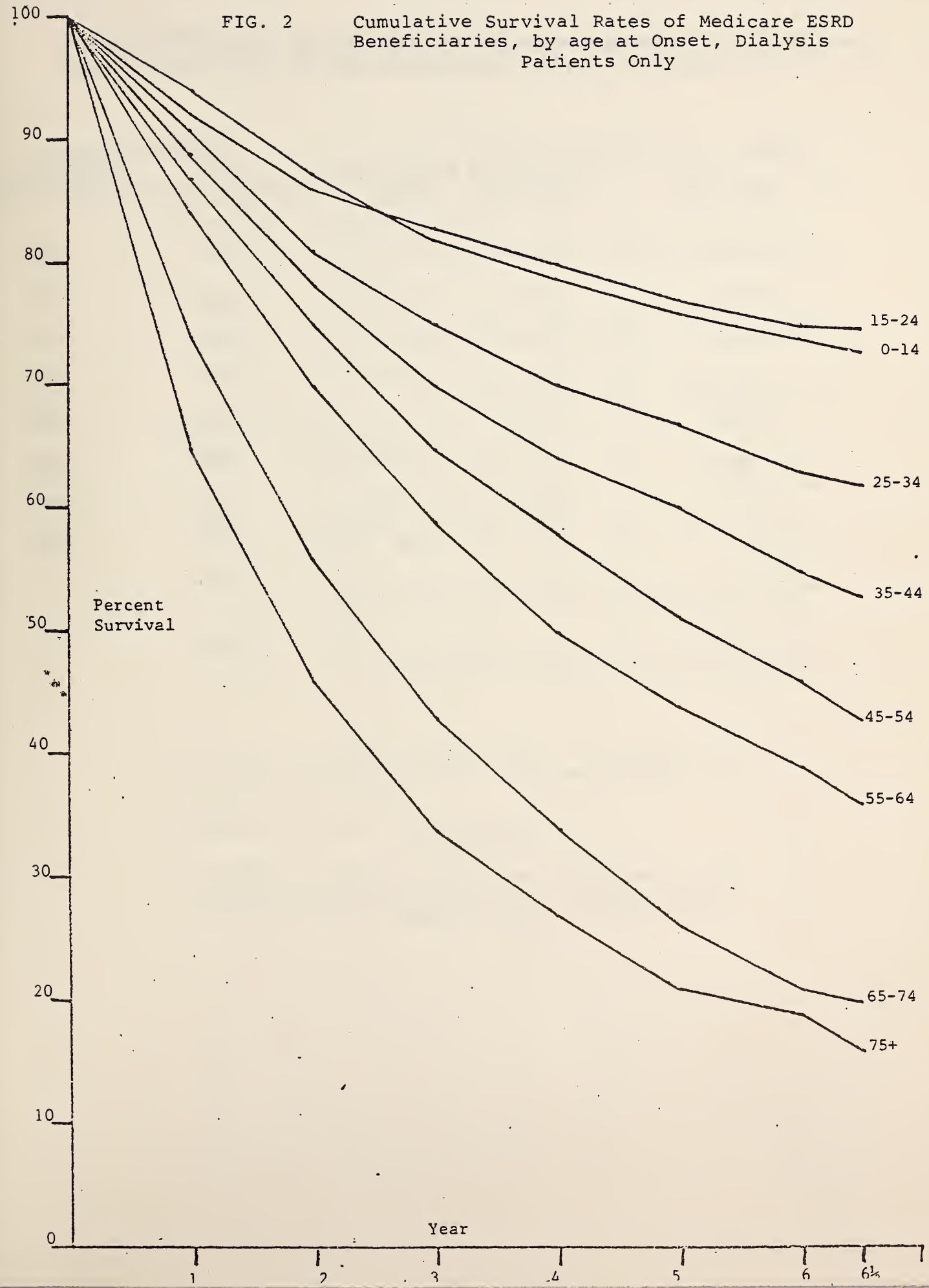


Table 14: Five-Year Mortality Rates for the U.S. Population and for Medicare ESRD Dialysis Beneficiaries, by age, during 1973-1979

Age Group	Percent Dying in Five years		Excess Mortality	
	Total Pop.	ESRD	Ratio ESRD/Tot. Pop.	Difference ESRD-Tot. Pop.
0-14	0.5	40	80	39%
15-24	0.6	36	60	35%
25-34	0.7	44	63	43%
35-44	1.3	47	36	46%
45-54	3.1	54	17	51%
55-64	7.2	59	8	52%
65-74	14.8	70	5	55%
75+	31.1	78	3	47%

Table 15: Cumulative Survival of Medicare ESRD Beneficiaries, By sex and race, age Adjusted[1] during 1973-1979

		Year From Renal Failure Onset[2]						
		1	2	3	4	5	6	6 1/2
	N*							
All Persons	(74,547)	81	67	57	50	44	39	37
		(.1)	(.2)	(.2)	(.2)	(.3)	(.3)	(.3)
Sex								
Male	(41,827)	82	67	57	49	43	38	36
		(.2)	(.3)	(.3)	(.3)	(.3)	(.4)	(.4)
Female	(32,719)	82	69	60	53	48	43	39
		(.2)	(.3)	(.3)	(.4)	(.4)	(.4)	(.6)
Race								
White	(50,907)	81	67	57	50	44	39	36
		(.2)	(.2)	(.3)	(.3)	(.3)	(.3)	(.4)
Black	(19,414)	84	70	60	53	46	42	39
		(.3)	(.4)	(.4)	(.5)	(.5)	(.6)	(.8)
Other	(2,001)	83	69	59	51	45	41	38
		(.9)	(1.1)	(1.3)	(1.4)	(1.6)	(1.8)	(2.4)
Unknown	(2,225)	79	69	62	56	52	47	43
		(.9)	(1.1)	(1.2)	(1.4)	(1.5)	(1.8)	(2.6)

[1] The rates have been adjusted to the age distribution of all ESRD beneficiaries.

[2] Standard errors are in parentheses.

* The number of persons is the number of persons at risk at the beginning of the first year. Subsequent years are based on smaller numbers of cases.

Table 16: Cumulative Survival of Medicare ESRD Beneficiaries (Dialysis Patients Only) by Primary Diagnosis 1973 to 1979[1] during 1973-1979

		Year From Renal Failure Onset[2]						
	(N)	1	2	3	4	5	6	6 1/2
DIAGNOSIS								
Glomerulonephritis	(8,006)	87 (.4)	73 (.5)	63 (.6)	54 (.7)	47 (.7)	42 (.8)	41 (.9)
Primary Hypertensive Disease	(6,823)	84 (.5)	69 (.6)	59 (.7)	51 (.8)	45 (.9)	41 (1.0)	40 (1.3)
Diabetic Nephropathy	(5,512)	73 (.6)	51 (.7)	37 (.8)	28 (.8)	21 (.9)	18 (.9)	17 (1.3)
Polycystic Kidney Disase	(2,528)	92 (.5)	82 (.8)	74 (1.0)	65 (1.2)	58 (1.4)	53 (1.7)	52 (2.1)
Collagen Vascular Disease	(601)	78 (1.7)	61 (2.1)	53 (2.3)	45 (2.5)	37 (2.7)	30 (3.1)	30 (3.1)
Other, Interstitial Nephritis	(3,040)	86 (.7)	73 (.9)	61 (1.0)	53 (1.1)	47 (1.2)	43 (1.3)	42 (1.4)
Other, Unspecified	(3,410)	77 (.8)	61 (.8)	50 (.9)	43 (1.0)	37 (1.0	35 (1.2)	32 (1.5)
Etiology Unknown	(4,114)	85 (.6)	71 (.8)	60 (.9)	52 (.9)	46 (1.0)	41 (1.2)	39 (1.4)

[1] Survival was not calculated for diagnoses in which there were few observations or for which the age distribution was so different from the total as to make direct age adjustment impractical.

[2] Standard errors are in parentheses.

Table 17: Medicare ESRD Dialysis Patient Survival, by age and Year of Renal Failure

Age at renal failure	Percent Surviving One Year					
	1974	1975	1976	1977	1978	1979
0-14	78 (3.7)	80 (4.0)	76 (3.9)	90 (3.3)	89 (2.8)	90 (2.9)
15-24	86 (1.5)	89 (1.4)	88 (1.5)	86 (1.6)	91 (1.3)	92 (1.4)
25-34	86 (1.2)	82 (1.3)	85 (1.1)	84 (1.2)	87 (1.0)	89 (1.1)
35-44	86 (1.0)	83 (1.1)	87 (.9)	85 (1.0)	86 (.9)	90 (1.0)
45-54	85 (.8)	84 (.8)	84 (.7)	85 (.8)	85 (.7)	86 (.9)
55-64	84 (.8)	83 (.8)	81 (.7)	82 (.7)	80 (.7)	83 (.8)
65-74	74 (1.3)	74 (1.3)	72 (.8)	74 (.9)	73 (.8)	72 (1.0)
75+	52 (3.7)	59 (3.4)	62 (1.3)	64 (1.8)	64 (1.6)	65 (1.7)
All patients	81 (.4)	81 (.4)	81 (.4)	81 (.4)	82 (.4)	83 (.4)

Table 18: Medicare ESRD Program Enrollment, by age, sex and race; 1974-81 (July 1)

	1974	1975	1976	1977	1978	1979	1980	1981	Percent Change 1974-81	Percent Change Avg. Yearly
TOTAL	15993	22674	28941	34778	43125	50829	57818	64063	+301	21.9
Age:										
0-14	211	315	363	402	401	605	695	815	286	21.3
15-24	1075	1543	1900	2166	2562	3146	3583	3836	257	19.9
25-34	1774	2688	3387	4196	5070	6283	7345	8485	378	25.0
35-44	2161	3127	4009	4787	5989	7279	8277	9248	328	23.1
45-54	3069	4509	5652	6697	8103	9284	10489	11550	276	20.8
55-64	2836	4394	5879	7353	9101	10742	12399	14018	394	25.6
65+	4868	6097	7751	9178	11899	13490	15030	16111	231	18.6
Sex:										
Male	9071	12597	15920	19063	23806	27989	31804	35168	288	21.4
Female	6921	10077	13021	15715	19316	22837	26010	28891	317	22.6
Race:										
White	11738	16411	20693	24620	30068	35201	39459	43266	269	20.5
Black	3560	5139	6871	8496	10834	12867	15028	16927	375	24.9
All Other	384	580	746	886	1177	1432	1716	1956	409	26.2
Unknown	311	544	631	776	1046	1329	1615	1914	515	29.6

Table 19: Annual Percentage Change in Medicare ESRD Program Enrollment, by age, sex and race, 1974-81

	1974-1975	1975-1976	1976-1977	1977-1978	1978-1979	1979-1980	1980-1981
TOTAL	41.8	27.6	20.2	24.0	17.9	13.8	10.8
Age:							
0-14	49.3	15.2	10.7	- .2	50.9	14.9	17.3
15-24	43.5	23.1	14.0	18.3	22.8	13.9	7.1
25-34	51.5	26.0	23.9	20.8	23.9	16.9	15.5
35-44	44.7	28.2	19.4	25.1	21.5	13.7	11.7
45-54	46.9	25.3	18.5	21.0	14.6	13.0	10.1
55-64	54.9	33.8	25.1	23.8	18.0	15.4	13.1
65+	25.2	27.1	18.4	29.6	13.4	11.4	7.2
Sex:							
Male	38.9	26.4	19.7	24.9	17.6	13.6	10.6
Female	45.6	29.2	20.7	22.9	18.2	13.9	11.1
Race:							
White	39.8	26.1	19.0	22.1	17.1	12.1	9.6
Black	44.4	33.7	23.7	27.5	18.8	16.8	12.6
All Other	51.0	28.6	18.8	32.8	21.7	19.8	14.0
Unknown	74.9	16.0	23.0	34.8	27.1	21.5	18.5

Table 20: Medicare ESRD Program Prevalence Rates per 1,000,000 Population by age, sex and race, 1974-81 (July 1)

	1974	1975	1976	1977	1978	1979	1980	1981	Percent Change 1974-81	Percent Change Avg. Yearly
TOTAL	76	106	135	160	197	231	260	286	276	20.8
Age:										
0-14	4	6	7	8	8	12	14	16	300	21.9
15-24	27	39	47	52	62	76	86	93	244	19.3
25-34	60	87	106	127	149	179	203	226	277	20.9
35-44	95	137	174	203	246	290	322	352	271	20.6
45-54	129	190	239	286	350	405	462	512	249	21.8
55-64	145	222	293	360	440	513	585	655	352	24.0
65+	223	272	338	392	497	552	603	635	185	16.1
Sex:										
Male	88	121	152	180	224	261	294	322	266	20.4
Female	64	92	118	141	173	202	228	251	292	21.6
Race:										
White	65	91	114	134	163	190	212	231	255	19.8
Black	151	215	284	345	436	512	591	658	336	23.4
All Other	123	172	208	235	298	348	399	437	255	19.8

Table 21 Medicare ESRD Program Enrollment By Diagnosis by Year, Percent Distribution, 1974-1981

DIAGNOSIS	Percent Distribution							
	1974	1975	1976	1977	1978	1979	1980	1981
ALL CAUSES	100%	100%	100%	100%	100%	100%	100%	100%
Glomerulonephritis	34.7	33.4	32.5	31.2	30.2	30.1	29.5	28.6
Primary Hypertensive Disease	13.5	13.9	14.3	15.5	16.8	17.0	18.2	19.0
Diabetic Nephropathy	7.7	8.2	8.6	9.6	10.3	10.4	10.5	11.8
Polycystic Kidney Disase	8.7	8.4	8.4	8.3	8.2	8.3	8.6	8.4
Collagen Vascular Disease	1.7	1.7	1.7	1.6	1.7	1.6	1.6	1.6
Interstitial Nephritis, Heredity	1.6	1.5	1.6	1.6	1.5	1.6	1.5	1.5
Interstitial Nephritis, Other	11.8	11.4	11.0	10.1	9.5	9.3	8.7	8.2
Analgesic Abuse Nephropathy	0.1	0.1	0.1	0.3	0.4	0.6	0.7	0.8
Obstructive Uropathy Acquired	0.3	0.3	0.3	0.8	1.2	1.3	1.4	1.5
Obstructive Uropathy Congenital	0.1	0.1	0.2	0.6	0.8	1.0	1.2	1.3
Amyloidosis	*	*	0.1	0.2	0.2	0.2	0.2	0.2
Multiple Myeloma	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Gouty Nephropathy	*	*	*	0 1	0.2	0.2	0.2	0.3
Other, Unspecified	9.9	10.3	10.4	9.5	8.8	8.4	8.0	7.4
Etiology Unknown	9.8	10.5	10.7	10.2	9.9	9.8	9.4	9.1

* Less than .1 percent.

Table 22 Medicare ESRD Program Enrollment By Diagnosis by Year, Rate per Million

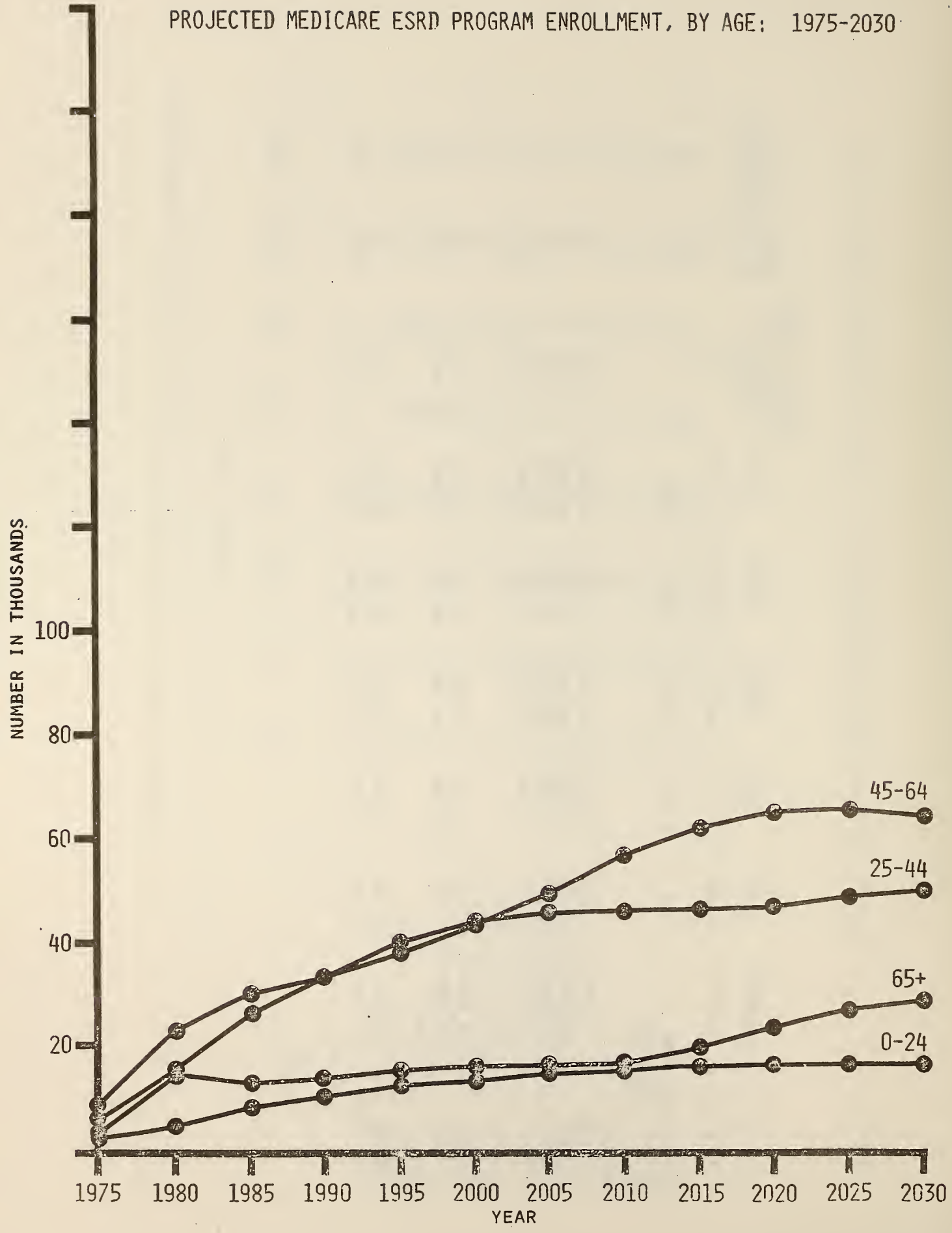
	Percent Distribution							
	1974	1975	1976	1977	1978	1979	1980	1981
DIAGNOSIS								
ALL CAUSES	76	106	135	160	197	231	260	286
Glomerulonephritis	26	35	44	50	59	70	77	82
Primary Hypertensive Disease	10	15	19	25	33	39	47	54
Diabetic Nephropathy	6	9	12	15	20	24	27	34
Polycystic Kidney Disase	7	9	11	13	16	19	22	24
Collagen Vascular Disease	1	2	2	3	3	4	4	5
Interstitial Nephritis, Heredity	1	2	2	3	3	4	4	4
Interstitial Nephritis, Other	9	12	15	16	19	21	23	23
Analgesic Abuse Nephropathy	*	*	*	*	1	1	2	2
Obstructive Uropathy Acquired	*	*	*	1	2	3	4	4
Obstructive Uropathy Congenital	*	*	*	1	2	2	3	4
Amyloidosis	*	*	*	*	*	*	1	1
Multiple Myeloma	*	*	*	*	1	1	1	1
Gouty Nephropathy	*	*	*	*	*	*	1	1
Other, Unspecified	8	11	14	15	17	19	21	21
Etiology Unknown	7	11	14	16	20	23	24	26

* Less than .1 percent.

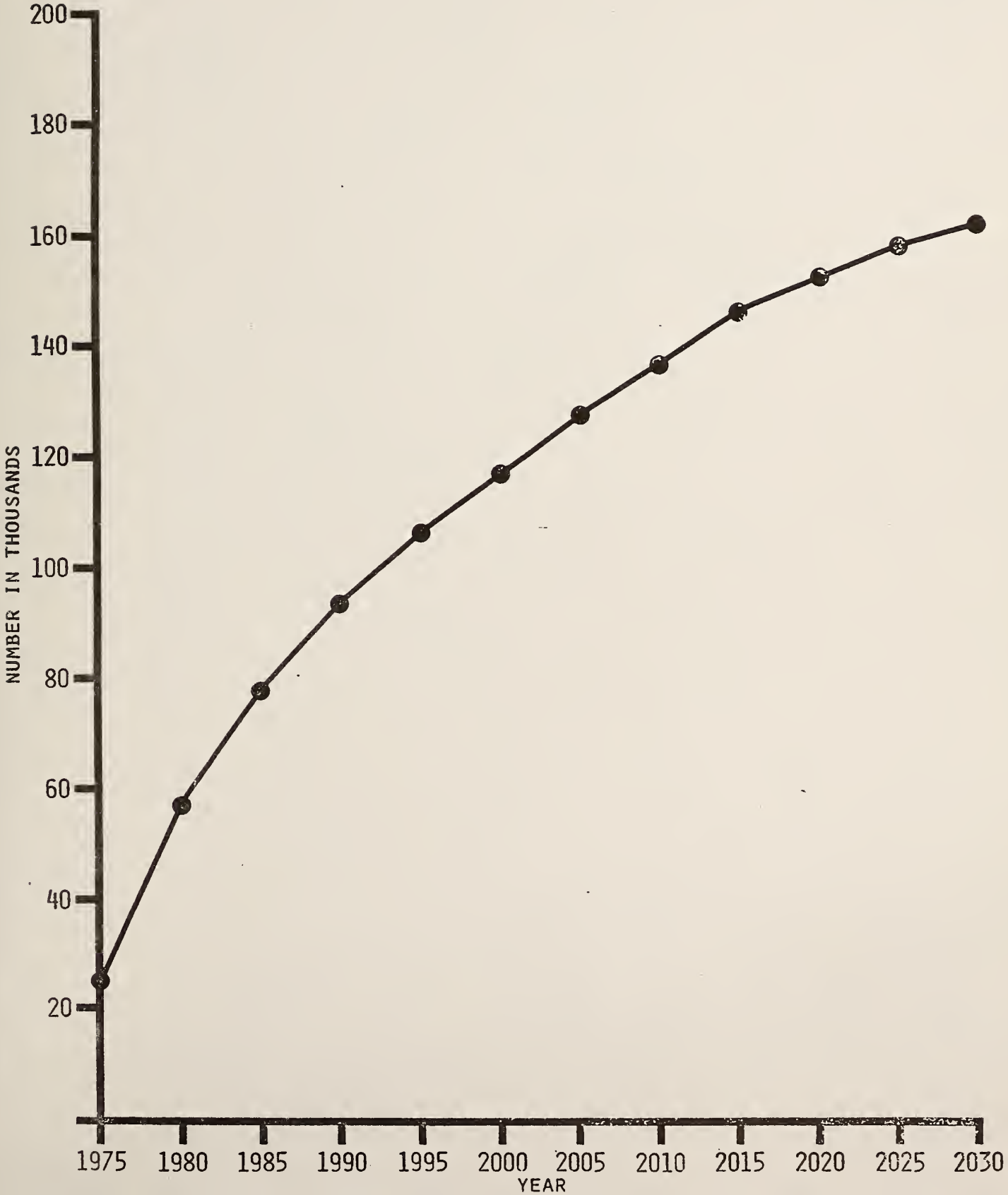
Table 23: Projected Medicare ESRD Program Enrollment, by age, sex and race, 1980 to 2030

	1980	1990	2000	2010	2020	2030	Percent Change in ESRD Pop. 1980-2030	Percent Change in U.S. Population
All Persons	57,800	94,400	117,200	136,700	152,800	162,100	180	35
Avg. Annual Percent Increase	--	50%	2.2%	1.6%	1.1%	0.6%	—	—
Age:								
0-24	4,300	10,800	13,100	14,900	15,700	16,300	279	11
25-44	15,600	34,100	44,400	46,500	47,800	50,600	224	24
45-64	22,900	34,700	43,300	57,700	66,100	65,200	185	53
65 +	15,000	14,800	16,400	17,600	23,200	30,000	100	121
Sex:								
Male	31,800	51,800	64,600	75,000	83,100	87,700	176	34
Female	26,000	42,600	52,600	61,700	69,700	74,400	186	37
Race:								
White	40,600	62,100	72,900	80,800	86,500	88,600	118	28
All Other	17,200	32,300	44,300	55,900	66,300	73,500	327	83

PROJECTED MEDICARE ESRD PROGRAM ENROLLMENT, BY AGE: 1975-2030



PROJECTED MEDICARE ESRD PROGRAM ENROLLMENT: 1975-2030



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